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ABSTRACT

An analysis of the regulatory activity of eight neurologically impaired/multiply handicapped children and eight normally learning children in two age groups (means 3 years 8 months and 5 years 9 months) was made. The children attempted to resolve conflicts that arose while balancing two wooden blocks, identical in appearance, except that one contained a hidden weight. Differences were found between the two types of learners in their approach to the situation as well as in strategies employed. These differences were greater in the older group. All children showed evidence of regulatory activity, but for the handicapped learners, this was represented as "islands" within a stream of discontinuous activity while for the nonhandicapped children a more continuous integration of ideas was observed. The groups did not differ appreciably in their ultimate recognition of and initial response to the conflict, but the normal children showed a more reflective consideration of constructive alternatives as compared to the more avoidant and inefficient attempts of the handicapped children. (Author/DB)

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Learning Strategies of Neurologically Impaired/Multiply Handicapped and Nonhandicapped Preschool Children

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In the literature relating Piagetian theory to exceptionality, two major lines of inquiry have emerged. The first has sought to determine whether exceptional children pass through the same sequence of stages as do normal children. The research to date suggests that, while the progress of exceptional children may be slower, the sequence of stages is the same for all children (Reid, 1978). A more recent trend within the Genevan framework is to focus not on what children know, but on how they arrive at a particular understanding. The interest here is not on the presence or absence of a particular cognitive structure, but on the self regulatory activity of a child engaged in learning. In examining these regulations it is hoped that the process of learning may be made clearer.

Among all children, the regulatory process may be understood as progressively evolving attempts to resolve contradictions or conflicts that arise from a pre-existing understanding that is no longer adequate to the learning situation. In normally learning children, regulation is seen as a "guiding idea" directing activity (Schmid-Kitsikis, 1973, p.700). In any unit of activity there is a sequence of anticipating a particular result, observing the effects of one's actions, and then employing feedback to make corrections or compensations if there is a discrepancy between what was anticipated and what actually happened. It is the child's active efforts to resolve these contradictions that lead to higher levels of

understanding. Regulatory activity then, is essentially the organizing activity and the strategies children use to construct knowledge for themselves.

Genevan research has begun to provide information about the regulatory activity of various disability groups (Reid, 1978). With exceptions based on the particular modality of the disability, certain generalizations can be distilled from this research. First, exceptional children tend to employ substitute mechanisms to compensate for their particular deficiencies. Next, the differences in the regulatory activities of normal learners and exceptional children appear to increase as the children grow older. Klees and Lebrun (1972) found that the tendency of dyslexic children to persist in their use of perceptual strategies despite consistent lack of success with such an approach, was most pronounced among the older children studied. Finally, the tendency to avoid cognitive conflicts, and the possible reasons for such avoidance, have been discussed as significant contributors to the learning problems of handicapped children (Schmid-Kitsikis).

An activity specifically designed to reveal regulatory activity was used by Karmiloff-Smith and Inhelder (1975) with normally achieving Genevan school children between the ages of 4.6 and 9.5 years. Five children between 18 and 39 months were also observed. The task consisted of balancing blocks with either obvious or hidden weights on a metal bar inserted in a support block. The youngest children tended to place the block on the bar at random points and then pushed down hard to make it stay. They gradually became more systematic in their efforts to balance the blocks. Four to six year olds started off with

similar behavior but quickly became involved in trying to balance the blocks in every different dimension. Proprioceptive information gained from making fine back and forth adjustments, was effectively used. More advanced children from this age group, and almost all children from age six to 7.5, began to demonstrate "theory-in-action" by placing the blocks on the bar at their geometric center. As they became more concentrated on how the blocks balanced, the theory that "things balance in the middle" seemed to impede their ability to use proprioceptive cues effectively. The inconspicuously weighted blocks, designed to balance off-center, which had previously been balanced without difficulty, now presented a serious challenge. After repeatedly failing to balance this block in the center, the seven to eight year olds gradually revised their geometric center theory. With many adjustments, pauses, and corrections, they were once again able to find the proper balancing point. It should be noted that younger children did not experience such difficulty with the inconspicuously weighted blocks, presumably because the proprioceptive information derived from trial-and-error manipulation was "uncontaminated" by theory. Finally, the oldest children studied were able to anticipate the problem presented by each type of block. They paused before placing the block, and, without having to first try the block in action at the geometric center, were almost immediately successful.

Reid and Knight-Arest (1979) adapted this task in studying learning disabled and normally achieving boys between the ages of 10 and 12. In an effort to learn what theories, if any, were

held about balancing, the children were first asked to explain how things balance. While all but one normal learner expressed their understanding in the form of a general rule, only two of the 10 learning disabled boys were able to do so. The others either expressed their initial theory in specific perceptual terms, or had no theory at all. As predicted, the normal learners were efficient strategists, able to anticipate results, make corrections, and revise their theories. The two learning disabled boys who held initial theories, used strategies that were comparable to the normal learners' and were also able to correctly revise their initial theories.

The other learning disabled children, however, performed similarly to the six and a half and seven year old Genevan children. Many appeared to be guided by the geometric center theory, but in a different way than the Genevan youngsters. The learning disabled boys successfully balanced the hidden weight block, but then incorrectly insisted that it was balanced in the middle. The Genevan children initially balanced this block correctly, but with the ascendance of the geometric center theory, became increasingly unable to do so. This failure, which represents a contradiction between what was anticipated and what actually happened, led to further exploratory activity and ultimately to success and revision of the theory. With the learning disabled children, however, it appears that the conflict necessary for cognitive growth was denied or avoided. When countersuggestions were offered by the interviewer to point up the conflict, these children resorted to irrelevant perceptual explanations.

The current study is offered as a qualitative analysis. We were interested in seeing whether normally learning American children of preschool age would approach the block balancing task with approximately the same sequence and repertoire of strategies shown by the Genevan children. We wanted to know whether handicapped children would be able to perform the task. If so, would their strategies and organizing activity differ significantly from that shown by normal children? Would there be a relationship between the particular types of compensatory mechanisms used by these children, and their specific disabilities? Also of interest is the relation between increasing age and decreasing effectiveness of strategies used by exceptional children. Would this relation hold up when the performances of six year olds were compared to four year olds? Most important, what kind of statements would we be able to make about the successes experienced by exceptional children? It was hoped that close examination of their performances would reveal the conditions leading to success, the children's response to it, and the activities leading out of it.

Method

Subjects

Of the 16 children interviewed, eight were normal learners and eight had been diagnosed as neurologically impaired or multiply handicapped. The normal learners were enrolled in a full day educational day care center. The handicapped children evidenced a variety of disabilities, but were similar in that the severity of their problems led to placement in a private school for children with moderate to severe learning disorders. These

two groups were further divided into two age categories. The younger group consisted of children from 2 years 10 months to 4 years 1 month ($\bar{X}$ =3years 8 months). The older children ranged in age from 4 years 10 months to 6 years 4 months ($\bar{X}$=5 years 9 months). All of the older children are boys. Among the younger children, there were three boys and five girls. The learning disordered children are from families of lower to lower-middle SES. The normal learners are from lower-middle through upper-middle SES. All of the children live in middle class suburban communities in the metropolitan area. Attempts were made to match children by age, sex, and socioeconomic status with limited success. Of the four younger learning disordered children, two exhibited such strongly negative reactions to the situation that their active engagement in the task was never obtained, and their performances were not included in the analysis.

Materials

Two wooden blocks were presented. They were identical in appearance except that one contained a hidden weight, causing it to balance off-center. The task was to balance the blocks on a metal bar inserted in a wooden support block so that the longer axis of the block was intersected by the bar.

Procedure

The children were videotaped as they performed the block balancing task. All children were first asked to explain what it means to balance something. Further questioning by the interviewer depended on the child's verbal and nonverbal responses. The children were encouraged to demonstrate their understanding not only verbally, but also through action. Considerable structure was imposed on the children's spontaneous activity. When

a child became diverted from the task, his or her attention was redirected . After the child was successful in balancing the unweighted block, and with it in place on the bar, the interviewer asked the child to explain how he or she had succeeded. With the first block still in place, the hidden weight block was then presented and the child was asked to balance it. Once this was done, the interviewer attempted to focus attention on the discrepant balancing points, and the child's explanations were solicited.

Results and Discussion

One of the most striking differences between the learning disordered and the normal children, particularly among the older group, was in their approach to the situation as a whole. The normal learners seemed to have an implicit understanding of what was expected. When they sat down and waited to have the task presented, they clearly understood the unstated "rules" governing the situation. The learning disordered children appeared to experience no clear demarcation between this task and whatever activity had preceded it. As they entered the room, they exhibited no expectations about this new situation, but instead seemed to follow an internally generated agenda. The interchanges between the interviewers and these children were quite different in quality than with the normal learners because of the necessity for almost constant intervention and structuring. Attitudes toward the problem itself were also different between the two groups of older children. The normal learners took ownership of the problem as soon as it was presented and it was never necessary to prompt or encourage them. With the handicapped children, there seemed to be little inter-

nalization of a problem solving set. For the most part, they worked with the blocks because they were asked to, but, except for brief flashes of interest shown, displayed little intrinsic motivation.

In comparing the performances of the American children with those of the Genevan children studied, the strategies used at the different age levels appear to be about the same. While the American four year olds used somewhat more advanced strategies than their Genevan counterparts, this may be partly due to the greater structure and direction provided by the interviewers.

When comparing the performances of our three year old learning disordered children with their normally learning agemates, it was difficult to discern significant differences. Both learning disordered youngsters began the task by playing with the blocks, but soon showed an orderly progression of attempts to balance them. Many of the three and four year olds interspersed their efforts with representational use of the blocks, e.g., forming letters of the alphabet, or building "bridges". The older normal children did not engage in this type of activity at all, but three of the older learning disordered children did.

All of the older children studied were successful with both the weighted and unweighted blocks. Among the normal learners, all were initially able to indicate an understanding of what it means to balance. When asked to explain their successes, three of the four offered versions of the geometric center theory. The older learning disordered children were unable to give a verbal explanation of what it means to balance. Indeed, they experienced much difficulty with both the

implicit demands of the situation and with the explicit verbal directions. It was necessary for the interviewers to give repeated verbal assists and gestural demonstrations. It took the learning disordered children much longer to balance the unweighted block, which was the first one presented. Once they did balance this block however, they were quickly successful with the more difficult weighted block.

Even in our small sample of older learning disordered children, there were many different handicapping conditions represented. Interestingly, the two boys who have sensory deficits in addition to other problems, showed compensatory behavior directly related to the deficient modality. Nick, who is nearly legally blind, exhibited an intense interest in tactual and very close visual inspection of the materials. Len, who is hearing impaired, responded inappropriately to verbal queries, but watched intently when gestural demonstrations were given, using them to advantage in his efforts.

The function of conflict in advancing cognitive growth has been discussed by Piaget (1977), and studied by Inhelder, Sinclair and Bovet (1974). In her survey of Genevan learning research, Duckworth (1979) proposed a developmental sequence in which at first, conflicting ideas are "compartmentalized" or separated, and thus provoke no efforts to construct a new understanding that will reconcile them. It is only when children experience the conflict and are disturbed by it that this construction can take place (p.303). It may be illuminating then, to look more closely at the roles conflict played among the children we studied.

The normal five and six year olds in this study, while clearly guided by the geometric center theory in action, had

not yet reached the stage in which their ability to balance the hidden weight block was impeded by adherence to this theory. When the discrepant balancing points of the two identically appearing blocks were pointed out, the two youngest boys in this group, ages 4 years 10 months, and 5 years 7 months, did not seem perturbed by the difference, and appeared satisfied by the fact that they had succeeded in balancing the blocks. The two six year olds saw that there was a difference and tried to minimize it by making minute adjustments of the blocks. They were able to make the blocks appear almost evenly aligned by putting one at a very slight diagonal across the bar. However, their continuing efforts to perfect the alignment, their puzzled expressions, and comments made by them suggest that these actions did not remove the contradiction. When asked, these youngsters sought explanation in the physical properties of the blocks, e.g. "one is bigger", "it's higher", "it's bumpy", but significantly, these explanations did not seem to satisfy them, and they persisted in exploratory activity. The explanations seemed to serve as hypotheses to be tested rather than wild guesses or final statements about the problem. The handicapped five and six year olds we studied showed idiosyncratic responses to the problem of the discrepant balancing points. While some of them made at least a partial effort to deal with this problem, their actions were usually ineffective and unrelated. One child moved the weighted block to where the unweighted block had sat on the bar. Another boy flipped the block over to the other side as if perhaps a different surface quality might affect his ability to balance it. While these actions might also be seen

as hypotheses testing, they appeared more as sudden random actions rather than part of a systematic exploration of the problem. There was little or no reflection after these actions, and these children did not appear to use the feedback from the consequences of their actions to build a more stable understanding. One boy actually turned completely away physically, when the contradiction was pointed out to him.

The learning disabled 10 to 12 year old boys studied by Reid and Knight-Arest were similar to our normally learning six year olds in the seemingly irrelevant perceptual explanations they offered for the discrepant balancing points. What seems significant, however, is that the learning disabled children, did not, apparently, continue to grapple with the problem after giving their explanations. Rather, they seemed perturbed by the fact of the conflict, and in response tried to suppress or deny it. The normal learners, even though much younger, were disturbed by the content of the conflict, which led them to continued efforts to solve the problem.

Why are the learning disordered children so distressed by the emergence of conflicting ideas? While regulatory activity obviously exists for these children, it does not serve them as well as their normal peers. They show a resistance to thinking about their own actions, and instead seem to expect answers to emerge from the physical properties of the objects (Reid, in press). Solutions tend to be specific, percept-bound, and are not easily generalized to more difficult problems. It is as if the links between meaningful sequences of activity are weak and incomplete, making it difficult for these

children to synthesize experiences into a comprehensive, cohesive understanding. As learning tasks naturally become more complex, the increasing difficulties in integrating what is known and applying it to new situations, has more crucial implications for the child's functioning. The child's awareness of the ineffectiveness of his efforts, the difficulty he anticipates when facing a new problem, may lead him to seek refuge in the very strategies that are hindering his cognitive growth. The avoidance of conflict in learning disordered children is probably the result of a complex interaction between the increasing difficulty of tasks encountered, reliance on less effective strategies often leading to failure, and resultant affective and motivational factors.

There is much evidence to suggest that the regulatory activity of learning disordered children does not easily lead to higher levels of thought. However, in our study, close analysis of the videotapes revealed occasional brief "islands" of efficient behavior in which the learning disordered children did appear to pause before an action, perform the action, then reflect on the result. These sequences, which had a duration of only a few seconds, were not immediately apparent because they were embedded in the "noise" generated by inappropriate use of the blocks, irrelevant verbalizations, and turning away entirely from the task. These brief sequences were vulnerable to the slightest disruption. They could be broken up by a block falling, an interviewer's question, or by an internally generated distraction. Nevertheless, they did occur, and they did lead to successful action. Future studies may want to examine these "islands" more closely. The learning disordered

child may need help in recognizing and selecting more appropriate strategies from among those that are already in his repertoire.

Despite the dangers of over interpretation, we believe that the use of videotapes makes possible a detailed analysis of behaviors often overlooked. Hesitations, pauses, sighs, the changing tempo of different actions, and even a smile, may all give valuable insight about the mental activity they accompany, yet are usually too subtle or too fleeting to be noticed. It is hoped that by examining these behaviors more closely, we may learn to read them with increasing comprehension in our work with children.

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